Utility Perspective on Reliability, Integrating Utility Scale Renewable Generation, and Managing Grid Resource in California and Mexico

SDGE connected

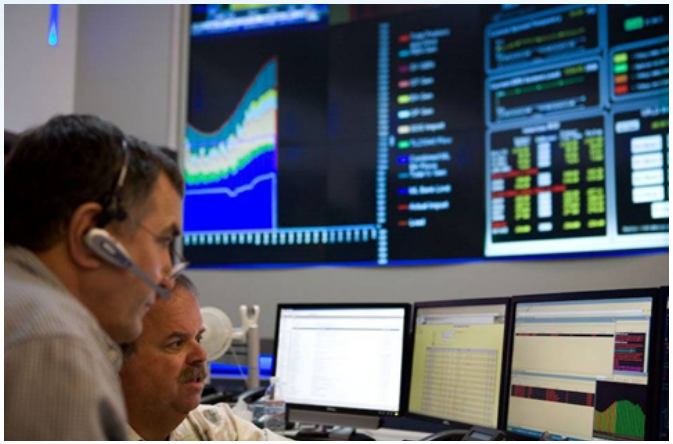
A Sempra Energy utility℠

Presentation by Ali Yari, Director - Electric Grid Operations, for the Technical Workshop on Efficiency, Renewables and Grid Management

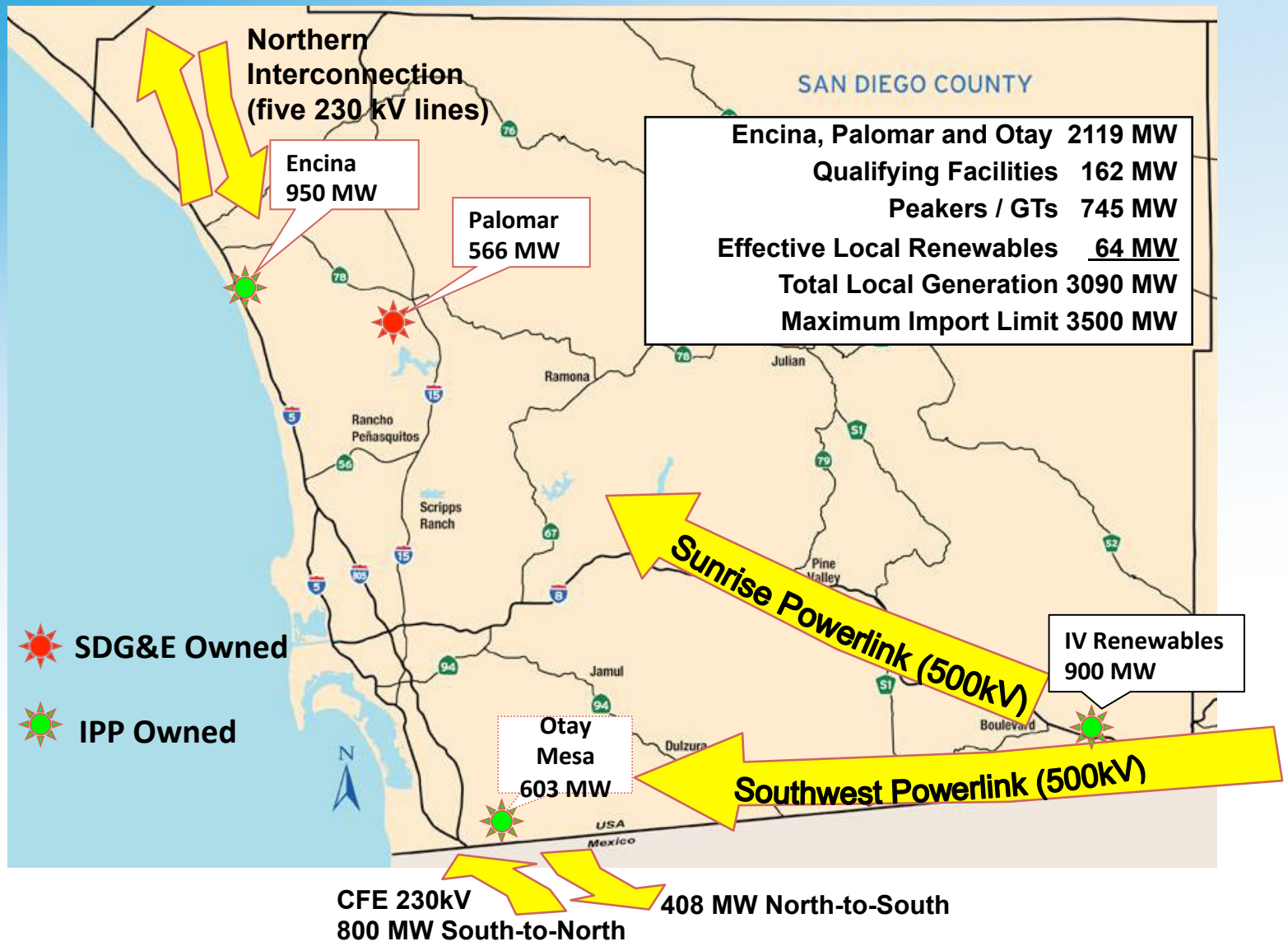
August 19-21, 2015

SDG&E's Electric Grid Operations

- **Monitor & Control Transmission System in a Safe and Reliable Manner**
  - Transmission System Voltage Levels: 500 kV, 230 kV, 138 kV and 69 kV
  - 1,929 circuit miles of transmission lines
  - 159 Total Substations, of which 18 are Transmission-Level
  - Voltage, Load, Flows, Frequency, System Issues
  - Reduce / Mitigate Real-Time Customer Outages
  - Study Systems Limits
  - Direct Maintenance Outages
- **Maintain Compliance**



Interconnections and Generation



Importance of Reliability

- Reliability is mandated; many entities involved in reliability
  - First Line of Defense: Utility Companies such as SDG&E have a strong self-interest in reliability and compliance
  - California Public Utilities Commission (CPUC)
  - California Independent System Operator (CAISO)
  - Peak Reliability (the Reliability Coordinator for the western region)
  - Western Electricity Coordinating Council (WECC)
  - North American Electric Reliability Corporation (NERC)
  - Federal Energy Regulatory Commission (FERC)
- SDG&E is at the forefront of reliability and change
  - SDG&E recognized by PA Consulting Group as "Best in the West" with ReliabilityOne Award for reliability performance among utilities in the west for nine consecutive years
  - SDG&E also received National Reliability Excellence Award for 2010, and again in 2014 for using smart meters to speed up detection of power outages and restoration
  - SDG&E received 2012 Smart Grid Award from POWER magazine for launching one of the most ambitious and comprehensive smart grid deployment programs in the nation

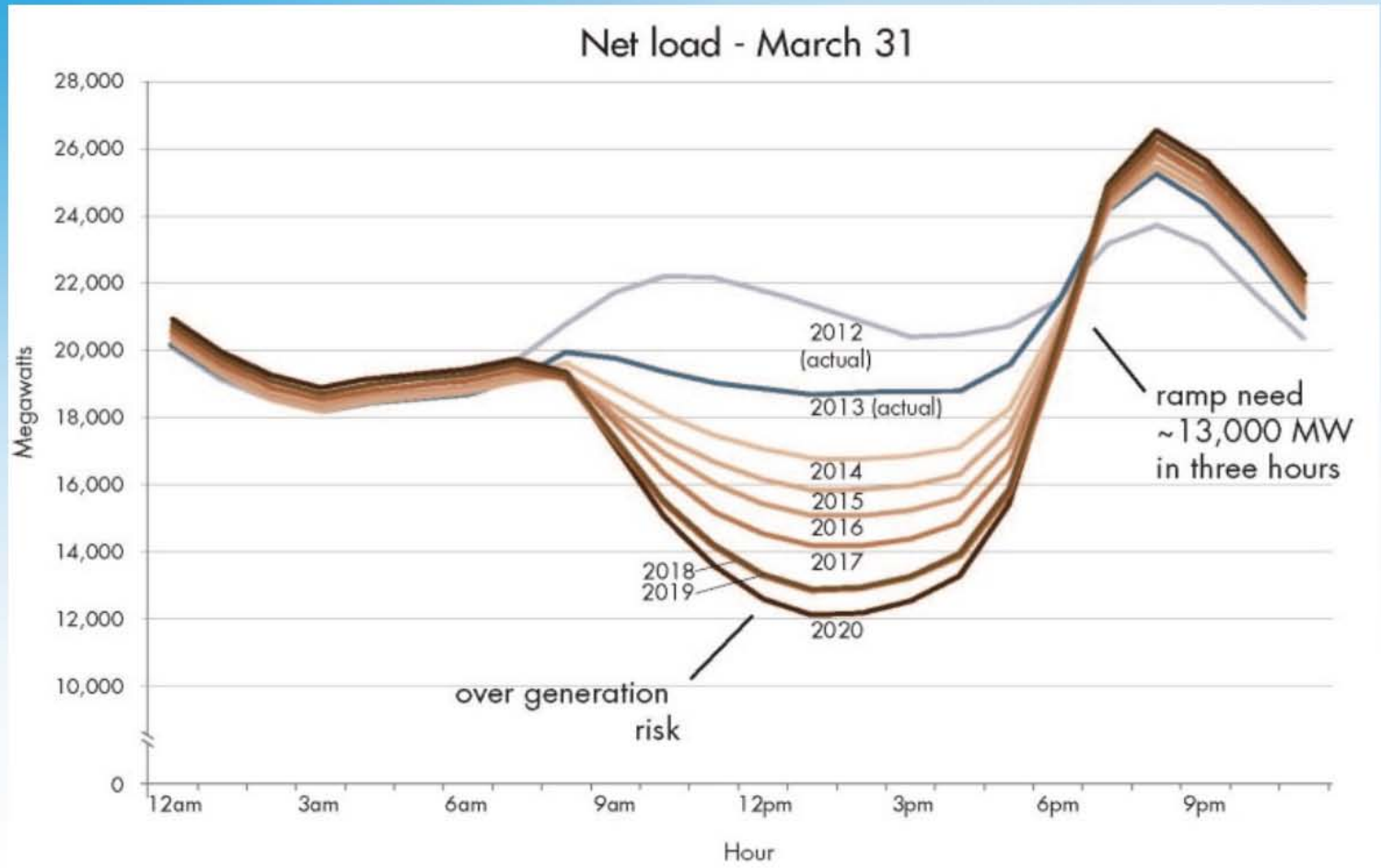
Renewables on SDG&E's System

- Total capacity of renewables connected to SDG&E's system
  - Solar – 630 MW
  - Wind – 315 MW
  - Pumped Storage – 40 MW
- Due to varying conditions, Net Qualifying Capacity (NQC) is less
- Renewables Portfolio Standard (RPS) Requirement of 33% by 2020 in California
  - SDG&E amount under contract for 2020 is already at 38.8%
  - Private rooftop solar installations are in addition to the amount contracted

Emerging Reliability Issues

- Dispatchable generation (gas-fired) being replaced by non-dispatchable generation (renewables)
- Of course, renewables are desired and eco-friendly … and mandated
  - Renewables create greater-and-greater challenges for reliable grid operation
  - Renewables are intermittent
    - Solar comes and goes with the solar day, and surprises (cloud cover) also occur
    - Wind also varies, sometimes unpredictably
- With increased energy supplied by renewables and reduced energy (megawatt-hours) supplied by gas-fired generation comes increased power demand (megawatts) for fast-start, fast-ramping gas-fired generation
  - Must be prepared for fast starts and fast ramping up or down to compensate for changes in renewable generation output during the day in order to maintain grid reliability and serve customer load as it changes throughout the day

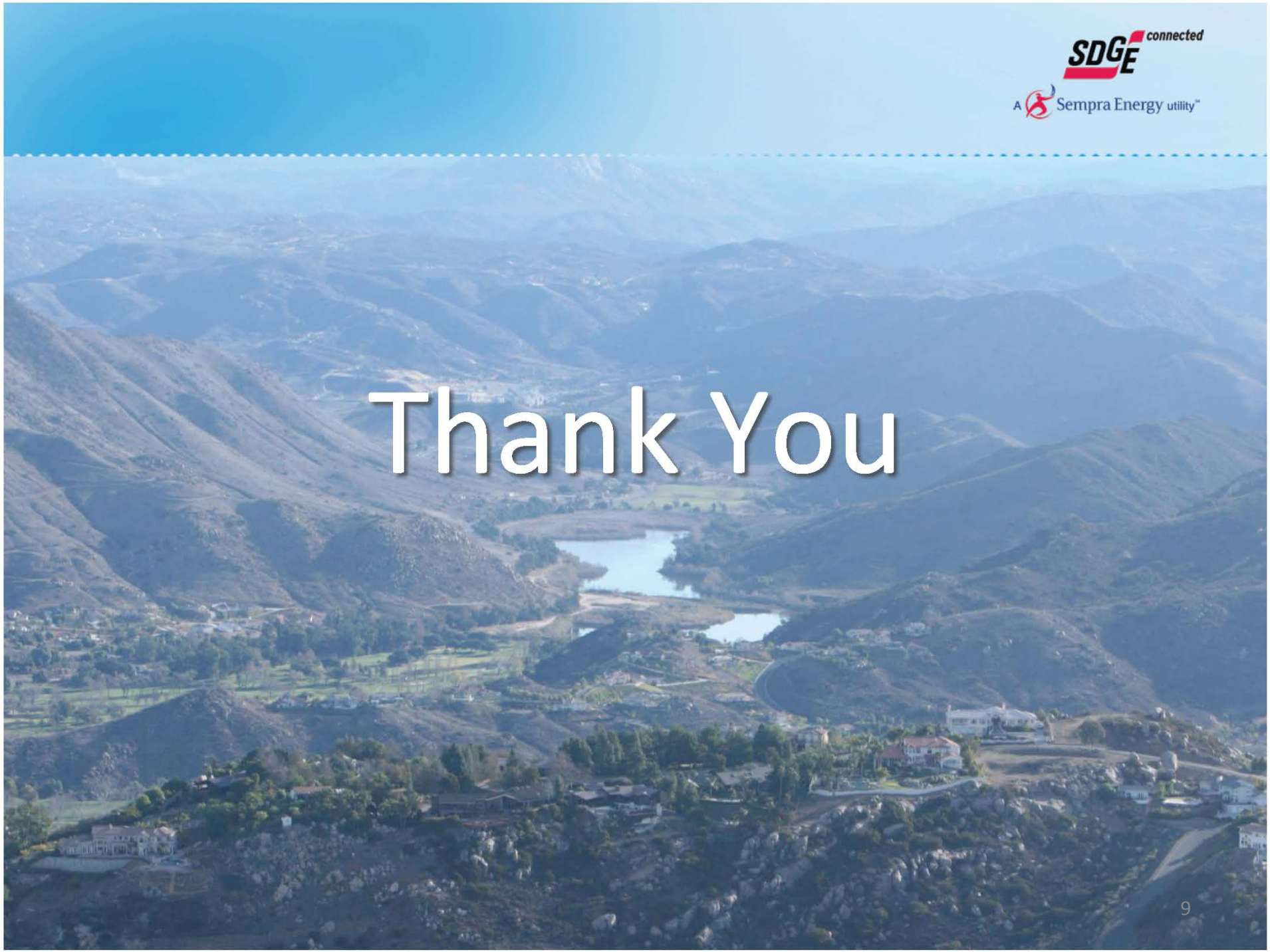
"Duck Curve" Reflects Operating Issues



Credit to "CAISO Fast Facts", *What the duck curve tells us about managing a green grid*

Interactions with Mexico (CFE)

- CFE is Comisión Federal de Electricidad
- SDG&E has two 230 kV Interties with CFE
  - Tijuana – Otay Mesa
  - La Rosita – Imperial Valley
- 230 kV Interties collectively known as WECC Path 45, rated
  - 408 MW North-to-South
  - 800 MW South-to-North
- Some generation in Mexico connected directly to SDG&E substations without using Path 45
  - Fossil-fueled generation in Mexico connected to Imperial Valley Substation
  - New ESJ wind generation connected to East County (ECO) Substation


SDGE connected
A Sempra Energy utility™
Thank You